

# Databases and SQL

## Homework

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# Install and configure a MySQL server

## Installation of the mysql-server package

```
apt-get install mysql-server
```

## Installed packages

- libaio1
- libdbd-mysql-perl
- libdbi-perl
- libhtml-template-perl
- libmysqlclient18
- libnet-daemon-perl
- libplrpc-perl
- mysql-client-5.5
- mysql-common
- mysql-server
- mysql-server-5.5
- mysql-server-core-5.5

# Connecting to MySQL and basic database management

## Connecting to MySQL in Bash

```
mysql -u user -p
```

## CREATE USER statement

```
CREATE USER username [IDENTIFIED BY password];
```

## CREATE DATABASE statement

```
CREATE DATABASE databasename;
```

## Creating an user and a database

```
CREATE USER u1;  
CREATE DATABASE db1;
```

# Basic database management

## GRANT statement

```
GRANT priv_type a on {tbl_name | * | *.* | db_name.*} TO user;
```

<sup>a</sup>for priv\_type check <http://dev.mysql.com/doc/refman/5.1/en/grant.html>

## Granting u1 full access to db1

```
GRANT ALL ON db1.* TO u1;
```

## Creating a second user and granting read access to db1

```
CREATE USER u2;
```

```
GRANT SELECT ON db1.* TO u2;
```

# Basic database management

Retrieve the rights of an user

```
SHOW GRANTS FOR user;
```

Remove rights of an user

```
REVOKE priv_type ON {tbl_name | * | *.* | db_name.*} FROM user;
```

# Basic database management

## CREATE TABLE statement

```
CREATE [TEMPORARY] TABLE [IF NOT EXISTS] tbl_name  
create_definition a
```

<sup>a</sup>for create\_definition check

<http://dev.mysql.com/doc/refman/5.1/en/create-table.html>

## CREATE TABLE with two columns and a primary key that spans over two columns

```
CREATE TABLE t1 (id INT(10) AUTO_INCREMENT, int_val INT(10),  
text_val VARCHAR(55) NOT NULL, PRIMARY KEY (id, int_val));
```

# Basic database management

## Access database via Perl

```
#!/usr/bin/perl -w
use strict;
#perl package for database connection
use DBI;
#connect to database via the mysql socket
my $dbh = DBI->connect('DBI:mysql:db1', 'u1', '')
    or die "$DBI::errstr";
#do function for simple statements
$dbh->do('CREATE TABLE t1
    (id INT(10) AUTO_INCREMENT, int_val INT(10),
    text_val VARCHAR(55) NOT NULL,
    PRIMARY KEY (id, int_val));');
#don't forget to disconnect ;-)
$dbh->disconnect();
```

# Basic database management

## Access database via Perl

```
...  
my $sth = $dbh->prepare( 'SELECT * FROM t1;' );  
$sth->execute();  
while($sth->fetchrow_array()){  
    my @results = $sth->fetchrow_array()  
}  
...
```



# Creating a backup from database

## Creating a backup via mysqldump

```
mysqldump -u user -p databasename >database.backup
```

dumps whole database into one file

## Creating a backup directly from mysql

```
SELECT * INTO OUTFILE 'database.backup'a FROM table_name;
```

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<sup>a</sup>file appears in /var/lib/mysql/db\_name/

you have to create a file for each table

# Questions

Display default properties

```
SHOW VARIABLES;a
```

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<sup>a</sup>change variables in `/etc/mysql/my.cnf`

What is the TCP/IP Port the MySQL server/ client applications will listen to?

3306 (port)

How many concurrent sessions the MySQL server will allow?

151 (max\_connections)

What is the size of the query cache used to cache SELECT results?

1048576 (query\_cache\_limit)

# Server status

Display server status with bash tool

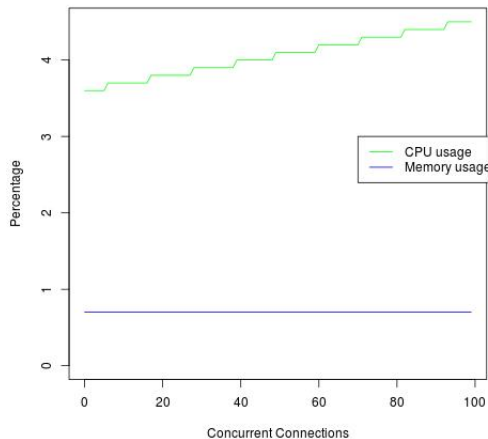
```
mysqlreport -u user -password=
```

Display server status with MySQL built-in method

```
SHOW STATUS;
```

# Monitoring of CPU and memory usage

CPU and memory usage at increasing number of connections



## Monitoring

```
ps -ax | grep mysqld  
ps -p <pid> -o %cpu,%mem
```

# Performance gain via optimization of server variables

## Server variables

- `key_buffer_size`
- `table_cache`
- `sort_buffer_size`
- `read_buffer_size`

# Storage engines

- MyISAM: high-speed storage, but not transaction-safe
- MEMORY: creates in-memory tables (fast, not transaction-safe)
- InnoDB: provides transaction-safe tables
- CSV: stores data in text files
- ...

# References

- <http://dev.mysql.com/doc/refman/5.1/en/server-system-variables.html>
- <http://dev.mysql.com/doc/refman/5.1/en/create-user.html>
- <http://dev.mysql.com/doc/refman/5.1/en/create-database.html>
- <http://dev.mysql.com/doc/refman/5.1/en/grant.html>
- <http://dev.mysql.com/doc/refman/5.1/en/create-table.html>
- <http://sql-info.de/mysql/examples/Perl-DBI-examples.html>
- <http://dev.mysql.com/doc/refman/5.0/en/server-parameters.html>
- <http://dev.mysql.com/doc/refman/5.0/en/storage-engines.html>

Thank you for your attention!